

# Non-inertial reference frame

# Goals for Lecture

- To understand how to describe motion in non-inertial reference frame.
- To understand what inertial forces are and describe their types.
- To formulate the equation of motion in non-inertial reference frame.

# Why is description of motion in non-inertial reference frame important?

- 1 Newton's second law  $m\vec{a} = \vec{F}$  holds true only in inertial coordinate systems.
- 2 However, there are many noninertial (that is, accelerating) frames that one needs to consider, such as elevators, merry-go-rounds, and so on.
- 3 Is there any possible way to modify Newton's laws so that they hold in noninertial frames, or do we have to give up entirely on  $m\vec{a} = \vec{F}$ ? It turns out that we can in fact hold on to  $m\vec{a} = \vec{F}$ , provided that we introduce some new «fictitious» forces. These are forces that a person in the accelerating frame thinks exist.
- 4 Consideration of noninertial systems will enable us to explore some of the conceptual difficulties of classical mechanics, and secondly it will provide deeper insight into Newton's laws, the properties of space, and the meaning of inertia.